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INDUSTRY SECTOR MARKETS 1991-1996

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1280 Villa Street
Mountain View, CA 94041-1194
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Industry Sector Markets, 1991-1996
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MAPTC • 301 • 1991

Table of Contents

Table of Contents (Continued)

Exhibits

Exhibits (Continued)

Introduction

A

Purpose and Methodology

This report is provided as part of INPUT's Market Analysis Program. The telecommunications sector is one of 15 industry-specific sectors defined by INPUT as part of the information services industry.

The telecommunications sector was analyzed using data about telecommunications expenditures for information services and data from INPUT's Vendor Analysis Program (VAP). This material was used, with INPUT's data base and files, to prepare the forecast in Chapter IV.

Frequently used acronyms and other technical terminology used in this report and related to the information services industry and the telecommunications industry sector include:

- Compound Annual Growth Rate (CAGR)
- Information Systems (IS) - Hardware and software systems and services required to acquire, manipulate, store, move, have access to, and report large amounts of data to users in a meaningful way. These programs include the traditional data processing and telecommunications services required to satisfy a company's internal information needs.
- Information Services - The term used to describe the software and services industry (vendor revenues) and markets (user expenditures).

Definitions unique to the telecommunications industry are shown in Appendix A.

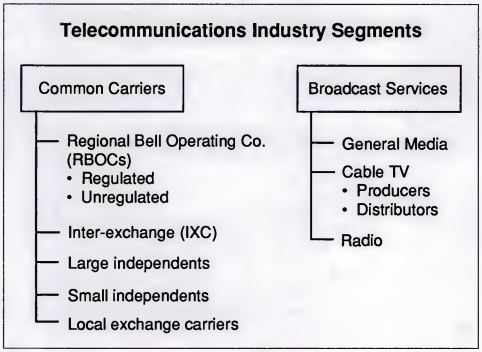
B

Industry Structure

The industry is divided into two major segments. The first is comprised predominantly of traditional common carriers (telephone and circuit providers). The second is comprised of broadcast service providers, such as general media and cable TV service providers. The categories are derived from the Standard Industry Classification (SIC) code for Communications (SIC code 48).

A composite industry structure is shown in Exhibit I-1.

EXHIBIT I-1



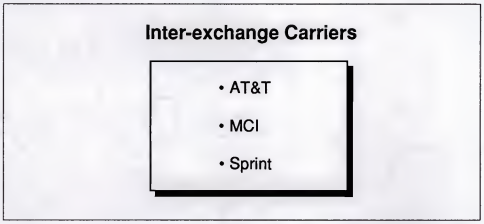
There are several groupings of common carriers. They include the Regional Bell Operating Companies (RBOCs), part of the Regional Holding Companies (RHCs); the inter-exchange carriers (IXCs); several large independent providers; a number of smaller independent providers; and many smaller local exchange carriers (LECs).

The RBOCs include regulated entities (BOCs) that primarily provide basic transport services to predefined areas throughout the United States. They also include non-regulated entities that have emerged since deregulation. The non-regulated entities can provide a wide variety of services to customers throughout the world. The RBOCs are shown in Exhibit I-2.

EXHIBIT I-2

Inter-exchange carriers (IXCs) provide service among the local service areas of the RBOCs. Major IXCs are shown in Exhibit I-3.

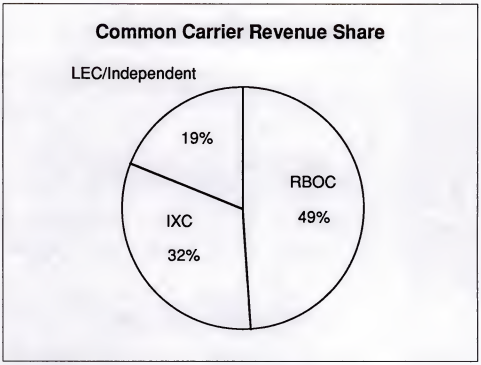
EXHIBIT I-3



In addition to the providers in these two categories, there are numerous independent service providers. The recent merger of Contel and GTE establishes Contel as the largest independent provider.

Considered in total, there are an estimated 2,000 providers of telephone and circuit services. However, the majority of the industry's revenues are realized by the top 10 to 12 companies. Exhibit I-4 shows an estimate of the division of basic service revenues among the common carriers.

EXHIBIT I-4



Providers of broadcast services fall into three basic groupings:

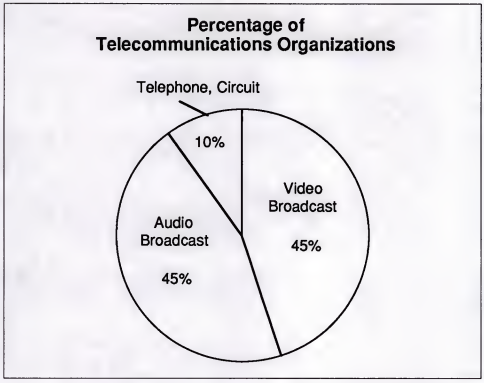
- General media broadcasters. These include the major networks (ABC, CBS, and NBC), which are supported by over 650 affiliated and 400 independent stations.
- Approximately 70 cable TV program networks. These provide programming to more than 9,500 cable systems throughout the country.
- More than 10,000 licensed radio stations.

The market for information services can be divided into three distinct groups:

- The RBOCs and IXCs identified in Exhibits I-1 and I-2.
- Numerous local and independent providers. Local providers may be able to provide only basic services. Independent providers frequently focus on a specific product or service. Information service needs are significantly different for these two.
- Providers of broadcast services. These include public broadcast services such as ABC, CBS, and NBC; cable TV program networks and broadcasters; and radio stations.

In total, there are an estimated 22,000 organizations in the telecommunications sector that have requirements for information services. These can be divided into three broad categories shown in Exhibit I-5.

EXHIBIT I-5



A vendor must recognize that 10% of the organizations providing telephone and circuit services account for the majority of information services expenditures. However, there are several areas within the broadcast industry where expenditures are significant. These are discussed in Chapter IV.

C

Organization and Contents

This report is organized into six chapters and two appendixes. Remaining chapters are the following:

- Chapter II- discusses major trends, issues, and events affecting the telecommunications sector.
- Chapter III - discusses the information systems environment in the telecommunications sector. The chapter considers how information is used, the impact of new technologies on the use of information systems, and issues related to budgets and organizations.

- Chapter IV - provides a forecast for information services in the telecommunications sector. Following the forecast for the sector, analysis is provided by delivery mode.

- Chapter V - discusses the competitive environment within the telecommunications sector.

- Chapter VI - provides a summary of major areas of opportunity and makes recommendations to vendors entering or expanding in the telecommunications sector.

- The chapters are followed by two appendixes. Appendix A provides a number of definitions related to the telecommunications sector. Appendix B includes the data base used for the forecast. Appendix B also provides a reconciliation of this year's forecast with last year's forecast.

Trends, Issues, and Events

A Trends

Chapter II discusses both general business and technology trends. Within each, consideration is given to trends in both the common carrier and broadcast segments.

Examining each segment is important because a number of changes are beginning to set the stage for the way telecommunications services may be delivered in the future.

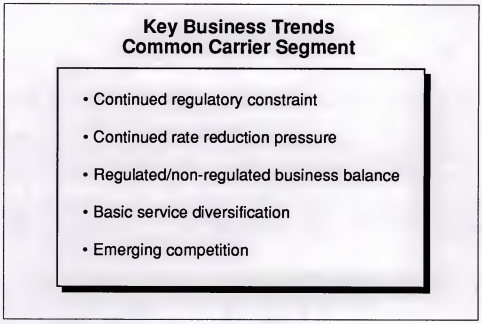
1. General Business Trends

Within the common carrier group, more than 90% of revenues are derived from regulated services. Consequently, regulatory considerations will continue to be a strong influence on the direction and rate of growth.

While the process of deregulation resulted in considerable confusion among service users and vendors, the initial, fundamental problems have been resolved. A number of significant business trends are apparent. INPUT expects the trends noted in Exhibit II-1 to affect the common carrier segment of the industry for at least the next several years.

- The RBOCs will continue to be constrained by the effects of the Modified Final Judgment (MFJ), but will continue to test the limits of the regulations. INPUT believes that, within the next five to eight years, the BOCs will be nearly free to compete in an open market, at least for enhanced services. The BOCs will be able to provide information (non-basic) services across LATA boundaries. They will compete directly for the provision of information services.

EXHIBIT II-1



- Public objection to rate increases for basic services will continue and may become stronger. While the FCC's policy change from revenue ceilings to price ceilings will allow service providers greater flexibility in making investment decisions, consumer advocate groups may become more aggressive in seeking rate reductions if they see greater profit margins.

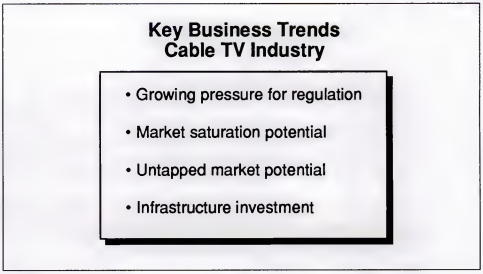
- There has been a recent shift toward the provision of enhanced (basic) service and flexible service to customers. Following several years of focusing on non-regulated business opportunities, many RBOCs have begun to place greater emphasis on their core (regulated) business. RBOCs have recognized there are opportunities to provide greater service, and derive greater revenues, within the context of existing regulations.

- As technology enhances the ability to deliver greater (switched network) bandwidth, the BOCs will look for more opportunities to provide enhanced (basic) services to businesses and the home. Technology advances will provide opportunities to diversify services.

- As the regulatory environment becomes more flexible, common carriers and large independents may find competition for data-related services emerging from the cable TV industry.

- There are several business trends, listed in Exhibit II-2, that suggest that the cable TV industry could emerge as a competitive threat.

EXHIBIT II-2



- As a result of continuing increases, there is growing pressure to establish regulations that will control cable TV rates. While there is no expectation for regulations in the near future, providers are increasingly sensitive to public perception of cable TV as a high-cost service. Because many municipalities permit only one cable TV provider, consumers believe they are being gouged.

- The cable industry can provide basic (cable) service to over 90% of the homes with television sets. Of these, approximately 60% already have service. The industry enjoyed a growth rate of 20% to 25% per year in the early 1980s, but since then the rate has dropped to 6% to 8% per year. The high penetration coupled with changes in the growth rate suggests that market saturation may not be too far off.

- While the consumer market may begin to approach saturation, the business market is largely untapped. Few business services are provided by the cable companies.

- Since the industry has focused on building an infrastructure to serve the (home) consumer, there are many areas in which service cannot currently be provided to business. But the same facilities that serve homes in large metropolitan areas (New York, Chicago, San Francisco, etc.) can also serve businesses in those areas.

- The cable TV industry is continuing to invest aggressively in new (fiber optic) facilities. New facilities are being built almost exclusively with fiber optic cables, and industry data indicates that older facilities are being replaced with fiber optic cables at a rate of 15% per year. While coaxial cable technology may have been a limiting factor in the past, use of fiber optic cables will result in an ability to deliver quality, broadband, digital services within the next several years.

Enhancing its service base could result in two significant benefits to the cable industry:

- With a broader base of services, capital and operating costs could be spread over more services, therefore reducing the costs for any one service.
- Adding new services and reducing costs for household services could reduce the regulatory pressures as well as create new sources of revenue.

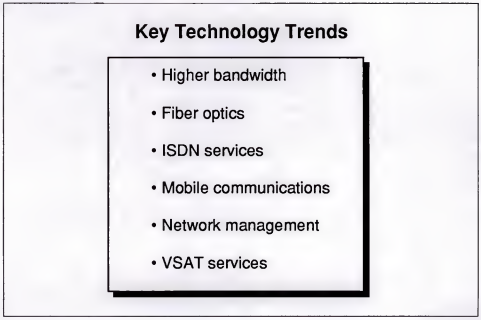
Two previously noted trends will continue to be significant considerations for common carriers:

- Mergers and acquisitions will most certainly continue, but the major efforts appear to be nearing an end. The two notable recent acquisitions/mergers were MCI's acquisition of Telecom-USA and the Contel/GTE merger, which can be considered significant changes in product/market positioning. But the number of mergers and acquisitions has dropped significantly.
- Foreign investment will also continue as a means to leverage expertise. However, many companies view foreign investments as risky, and greater scrutiny of the potential for return will tend to reduce the level of activity.

2. Technology Trends

Technology trends contributing to industry growth are shown in Exhibit II-3. While most are known technologies, their impact as growth enablers are only beginning to be felt.

EXHIBIT II-3



Of all the technological changes, higher bandwidth and fiber optics are continuing to have the greatest impact on how services are delivered.

- From comparatively recent efforts to tariff T1 and fractional T1 offerings, BOCs are now working to define services such as SMDS (Switched Multimegabit Data Service) to support metropolitan-area networking (MAN) requirements.

  The availability of significantly higher switched service bandwidth will provide an opportunity for BOCs to compete with alternative service (bypass) providers to meet metropolitan data networking needs. Once they have successfully demonstrated their ability to deliver MAN services, carriers will explore ways to integrate MANs with LANs.

  Since deregulation, local carriers have lost as much as 30% of their local (data) service customers to *bypass* alternatives. High-speed data switch is a service necessary to curtail market erosion.

- Within the next five years, the term ISDN (Integrated Services Digital Network) will nearly disappear from the public lexicon. Providers will begin to define *service sets* that require integrated digital technology, but will market *services*, not ISDN.

  Services actually brought to the public will be market driven. Users will be able to define specific services necessary to meet their needs and pay for them on a service-by-service basis.

  In addition, users will be able to define mixes of services to meet their needs, at costs commensurate with the services received. The need for customer-defined services will place significant demand on providers for flexible (intelligent) software.

- Mobile (cellular) communications has not yet achieved its potential. It will become increasingly important as emphasis shifts from basic telephone service to providing data transmission services. However, for mobile data to be effective, cellular service must become more reliable, especially in call management and the ability to switch calls between cells.

- With the growth of value-added services and virtual private networks, the BOCs will begin to be key providers of network management services. The BOCs will become more responsive to customer needs to have information about the operation and cost effectiveness of their networks. The BOCs will begin to provide considerably enhanced information about network design and operation.

However, for the BOCs to become accepted as network managers, they must provide significantly enhanced network management tools. They must also broaden their skills to include local-area networking services.

- Languishing as a technology until recently, VSAT (Very Small Aperture Terminal) is emerging as a direct competitor to leased circuits. It is increasingly seen as a cost-effective means of meeting data networking needs over wide areas. High-quality VSAT service will continue to grow as a direct competitor to leased data services. This will force data service providers to provide higher quality and become user oriented.

While the previous points are oriented primarily towards the common carrier segment of the industry, technology changes will also have an impact on the broadcast segment, particularly the cable TV industry. The two most notable technological advances are the growth of fiber optics and the availability of greater bandwidth.

- Fiber optics will provide a means to deliver a broader range of services than can be delivered today. With a fiber optic infrastructure, cable companies will be able to integrate one-way (broadcast) services with two-way (interactive) services. The ability to integrate one-way and two-way services opens new market opportunities.

- With greater bandwidth available, broadcasters will be able to provide a wider range of services directly to business and the home.

B

Issues and Events

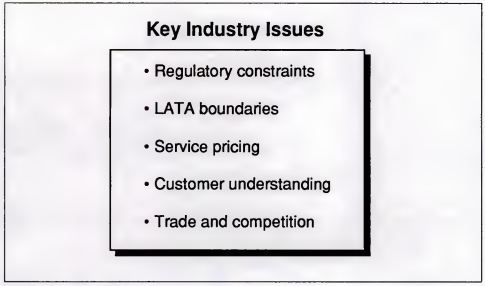
1. Key Issues

There are several significant issues facing both users and providers of (common carrier) telecommunications services. For vendors of information services to the this industry segment, understanding the issues is necessary for understanding how the industry will evolve over the next several years.

Companies continue to be concerned about the availability and cost of services; they have mounting concerns about the process of control and management of increasingly complex networks. Many companies consider the regulatory environment to be a shield that carriers use to avoid having to address users' needs. They consider LATA boundaries to be artificial barriers that prevent them from receiving quality services.

Customer questions and concerns form the basis for significant issues that face the common carrier segment of the telecommunications industry. Key issues are shown in Exhibit II-4 and discussed below.

EXHIBIT II-4



- Regulations imposed by the Modified Final Judgment continue to be the single most significant consideration for telecommunications service providers.

  While many questions concerning the Judgment have been resolved, and while there is only limited impact on numerous providers such as the smaller LECs and independent providers, considerations concerning the Judgment pervade nearly all business plans.

  The primary constraint is a restriction on using their installed base (imbedded circuits and switches) to provide information services. Until they are able to leverage under-utilized technology to deliver value-added services, the cost of basic services will remain comparatively high.

  Alternatively, the BOCs have begun to realize that valuable services can be provided within the bounds of the *allowable* services. The emphasis on allowable services is causing a number of BOCs to place greater emphasis on improving their core business services. This is resulting in greater balance in emphasis between regulated and non-regulated service.

- With the granting of permission to provide gateways, questions regarding *inter*-area services are becoming more acute. BOCs have indicated that some business services, such as E-mail and EDI, will not be cost effective if the service cannot be provided directly to a wide geographic (inter-LATA) area. This issue is expected to become increasingly important within the next several years.

- The pricing of services has been an issue since the inception of deregulation and is expected to remain an issue for some time.

Until the recent change from revenue to price ceilings, service providers had little incentive to provide cost-effective service. Improvements in cost effectiveness frequently did not result in the long-term investments necessary to continue high-quality service, since the profits could not be retained for reinvestment. In addition, with pricing based on costs, carriers were actually encouraged to accept higher expenses as a means of justifying higher rates. With the change, providers are expected to have greater opportunity to invest in new technology and services.

- In a regulated environment, there was little incentive for carriers to understand customers' needs. Carriers offered limited services and made limited investment in understanding customers. This has begun to change. Carriers are focusing increasingly on their customers' need to integrate and manage complex network services.

- An issue of growing concern for many telecommunications services providers is the degree of competition from foreign providers and the corresponding inability of U.S. providers to achieve penetration into foreign markets.

  Since deregulation, service providers have noted an increasing share of their markets going to foreign companies. While the RBOCs and major independent companies (Sprint, MCI, etc.) will continue to be the major providers to U.S. companies, end users are beginning to look increasingly at foreign companies as service providers, which reduces the market size for U.S. companies.

  With an increasing share of the U.S. market being consumed by foreign-owned companies, and with business becoming increasingly global, many U.S. service providers are looking to foreign markets for opportunity.

  However, foreign markets are more tightly controlled, and market penetration has been difficult. The difficulty is expected to remain and, in areas such as Europe, could increase. Vendors successful in the *new* Europe will be those with a strong, established business base or relationships before the change in 1992.

- Compounding the difficulties of the carriers on one hand, and stimulating them to be more aggressive on the other, is the emergence of direct competitors to their future service offerings.

  - Technological advances and strategic alliances have placed VANs in a position to provide services that carriers once considered their sole domain. VANs are able to provide comprehensive network management products and services and will increasingly be able to meet user needs for local- , metropolitan- , and wide-area networking.

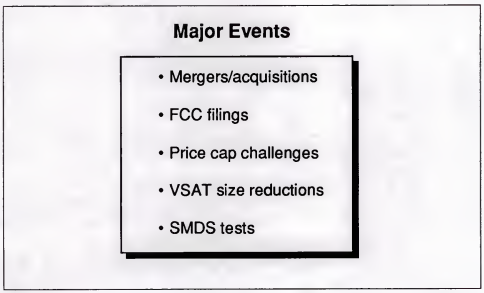
- Over the next several years, cable companies may become a significant competitive threat. As the companies change their networks from coaxial to fiber, they will develop excess capacity. INPUT expects cable companies to seek alternative services to utilize the excess capacity and provide a broader base of services.

2. Major Events

In this rapidly changing industry, there have been numerous significant events, such as rapid technology developments and mergers and acquisitions.

Exhibit II-5 summarizes a number of events that INPUT believes were significant, not because they received a great deal of attention in trade publications, but because they indicate industry trends.

EXHIBIT II-5



- The most notable merger/acquisition has been the Contel/GTE merger. The result of this is the establishment of Contel as the largest independent common carrier.

- Much less noticed, but of equal long-term significance, was the acquisitions of Appex and ONA by EDS. Superficially, these acquisitions appear to be simply systems operations contracts. They are more significant because they provide a base from which EDS can develop networking services for both the cellular and cable industries.

- The next major growth concentration of the cellular industry is expected to be in digital cellular technology, which may necessitate a national networking structure. EDS has an extensive network and the expertise to develop new products and services.

- In the past year, cable network providers have filed a very high number of applications to begin to test Personal Communications Services (PCS). This is the first step of the cable industry's entrance into the data services market. This entry will establish a base for the cable industry to become a direct competitor of established common carriers.

- There is growing concern over the FCC's decision to establish price ceilings for services. Whether this might effect a change or modification in pricing policies is unknown, but the challenges detract from a carrier's ability to move forward aggressively with new investments.

- GTE Spacenet and Hughes Network Services are now able to implement satellite terminals that measure less than 30 inches in diameter, described as USAT (Ultra Small Aperture Terminal) by one vendor. With the size reduction, satellite terminals can be more easily justified as an alternative to leased circuits. Widespread use will put further pressure on leased-circuit pricing.

- Several tests of Switched Multimegabit Data Service (SMDS) are in progress or have been announced. Success of the tests will mark the beginning of the BOCs' ability to offer comprehensive metropolitan- and then local-area networking from their central offices.

Viewed individually, these events might not be considered particularly significant. Viewed collectively, they indicate several important points.

- Non-traditional network service providers are beginning to establish positions that will permit direct competition with established common carriers.

- Common carriers (BOCs) are making rapid advances in providing more comprehensive, high-speed networking services.

- The availability of high-speed circuits is growing rapidly. Continued growth will cause a reduction in circuit costs. This will, in turn, cause growth in data networking services.

INPUT believes that these advancements are strong indicators of rapid growth of data networking services. Several problems still exist, but the stage is being set for a broad range of services to be available at more economical prices.

The stage is also being set for significantly greater competition in the provision of data networking services.

Information Systems Environment

A

Applications

Application requirements for the common carrier and broadcast segments of the telecommunications industry are considerably different. For this reason, each is addressed separately.

1. Common Carriers

Common carrier applications have traditionally been developed internally. Systems development staff at RBOCs and major IXCs and independents indicate that as much as 90% of their applications result from internal development. There are several reasons cited for the traditional emphasis on internal development by the major carriers.

- Few vendors have been able to provide application products suitable for the telecommunications industry. On the whole, users believe that their environment is far too complex for packaged applications.
- Few vendors understand the requirements of switching systems. Industry managers have believed that the high degree of integration needed between switch systems and support application systems necessitated a dedicated staff.
- Until deregulation, staff size was of only limited importance. Since prices were based on the company's cost structure, there was little incentive to reduce overhead costs.

Local exchange carriers and smaller independents that operate their own systems have generally been more receptive to packaged solutions than the large carriers. Since, in many areas, local exchanges serve primarily residential customers, they do not have as great a need for large, complex applications.

The large carriers also indicate that this situation has changed since deregulation and that they will look more to outside providers for assistance. Several reasons are cited for the changes.

- Most large carriers have had to make substantial reductions in staff. In an increasingly competitive environment, significant increases in staff productivity have been mandatory as staff size has been reduced.

- The nature of systems has been changing. While switching systems remain complex, requiring specialized expertise, there has been growing emphasis on applications that support the basic operational systems. The shift towards digital technology has fostered greater ease of integration between switching and control systems and support systems. The process of developing customer support and sophisticated billing systems requires less industry expertise and more design and development knowledge.

- Systems are growing more complex, requiring greater knowledge of business applications. Electronic mail (E-mail) and electronic data interchange (EDI) require an understanding of business interaction, not just telecommunications expertise. Unique (industry) expertise is important, but is growing less important relative to the need to understand how business operates.

- While the systems staff of common carriers have extensive expertise in switch system requirements and technology, they are frequently no more knowledgeable about local-area networks and open systems architecture than companies in other business sectors.

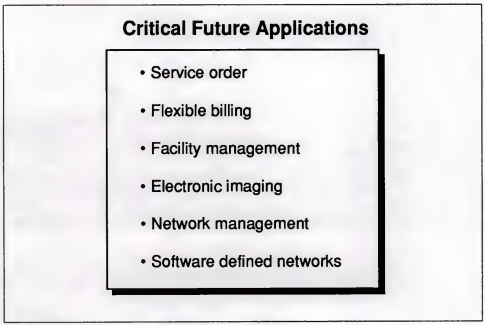
Nearly all managers indicate that they would acquire application products if the products were available, but they believe that the environment is sufficiently unique that few standardized products are likely to become available.

They indicate that the majority of expenditures will therefore be for systems integration and professional services to develop complex systems to support future service delivery requirements.

Exhibit III-1 provides a summary of the categories of applications that IS managers in common carriers believe will be most critical over the next several years.

While there is consensus on the applications that will be critical over the next several years, the same managers note a number of issues that hinder their ability to successfully develop the applications.

EXHIBIT III-1



- Service order complexity is growing. At the time of deregulation, order and customer information systems were old and inadequate. Large and small carriers invested considerable time and money in developing systems that were at least accurate. Just prior to deregulation, many carriers still used manual files to assign telephone numbers.

  While minimum needs have been generally met, technology and users' demands have not stagnated. Customers want to be able to initiate services from a terminal or touch-tone phone. They want to add service features, delete service features, and change service parameters (WATS, virtual network configuration, etc.) from remotely located devices. While providing basic access to these services is not exceptionally difficult, integrating orders with operational systems and order tracking and billing systems is highly complex. In addition, security issues can be major impediments.

  For software vendors and systems integrators, the problems are highly complex. In addition, specific customer requirements are generally not known. To date, RBOCs have been cautious in pursuing the development of highly integrated systems that provide dynamic changes to services, but all recognize the need.

  The need for caution is understandable. At the same time that customer demand is growing, the technology is changing rapidly. Major investments in specific applications could be outdated quickly. Some could even be outdated before development is completed. Carriers have placed their emphasis on developing applications that permit greater control of their environment. They are progressing cautiously in the development of highly flexible systems that could be outdated quickly or could cause them to lose control.

- Customers are also demanding flexible billing. Statements that provide a summary followed by a listing of detailed calls are no longer adequate. This is evidenced by recent announcements by major carriers of tailored billing statements.

  As enhanced services such as flexible WATS configurations and virtual circuit networks become more prevalent, customers want analysis of service cost as part of their billing. But as with service order systems, the carriers do not have a firm understanding of exactly what features are needed or what charges, if any, should be applied. They are also concerned about the effect on their operations.

- Facility management systems continue to be important, and enhanced systems are needed. Digital system facility maintenance is more difficult than old, manual systems because of the speed at which digital systems can change. Processes, and the accompanying information technology, are needed to control facility information quickly and easily.

- The need for electronic imaging is growing. The telecommunications industry is required to retain vast amounts of cost and facility information as well as copies of customer invoices.

- Nearly all carriers are interested in providing network management services. However, most recognize that they do not have adequately defined products or services for providing network management services.

- Large corporate customers have a need to modify their networks, sometimes frequently. Carriers providing virtual digital networks must be able to provide the means for customers to define and redefine the network structure through software. Few carriers have the necessary software to permit customers to control their (carrier-provided) networks.

2. Broadcast Services

Application requirements for broadcast service providers can be divided into two general groups.

- The requirements for network broadcasters and radio networks are predominantly internal. Federal requirements necessitate maintaining certain records of activities. Few requirements beyond maintaining legal records and developing programming schedules govern the activities of small operations such as local radio stations.

The activities of large (network) operations require extensive systems to maintain financial records, perform market analysis, develop schedules, and maintain legal records.

In both these cases, the systems are predominantly internal; there is little interface with the public. While applications may be necessary for maintaining control, they do not provide any competitive advantage.

- In contrast, the cable industry application requirements are more analogous to common carriers than to the broadcast industry. Systems are needed to perform traditional account control and billing functions and collection.

  Applications are also needed to record requests and bill for pay-for-view programs. They are needed to schedule connection and maintenance activities.

  In the cable TV industry, applications can be used to competitive advantage. Accurate and timely billing and collection activities can contribute to financial advantage. Comprehensive scheduling (customer hook-up and maintenance) systems can contribute to customer satisfaction and future revenues. They can also be critical to ensuring a positive public image which contributes to reduced regulatory scrutiny.

B

IS Issues

Issues facing the common carrier and broadcast segment of the telecommunications industry are quite different. Because of the differences, each is addressed separately.

1. Common Carriers

There are a number of issues facing the information systems organizations of carriers and independent service providers. As shown in Exhibit III-2, the majority relate, not to technology management, but to the organization.

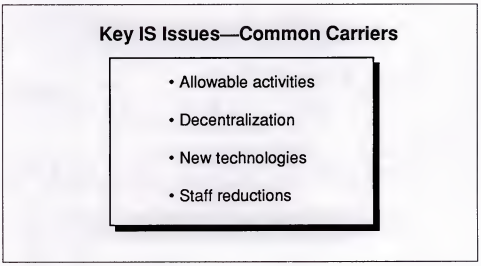
- The extent to which carriers are allowed to perform certain functions has a major impact on development approach and priorities, particularly when considering (regulatory and technological) changes that may or may not be forthcoming.

  - BOCs are not permitted to provide service outside their defined service area (LATA). They therefore have little direct control over the quality of data received. Systems development times are extended due to the need to coordinate with multiple organizations for the passing of information. Extensive coordination and technology compromise are necessary to implement new services. Coordination and compromise both add time and cost.

- As regulatory restrictions ease, many BOCs plan on being able to deliver services outside their immediate service areas. Decisions must be made about whether to incorporate future capabilities or to build more basic systems that must be changed at a later date. The latter will cause increased future costs to re-design requirements. The former causes higher short-term costs and risks exposure of future market strategies.

- Since regulated carriers are not permitted to utilize their existing asset base to deliver enhanced (information) services, caution must be exercised when planning to leverage existing applications. Utilizing an existing application as a basis for a new service can be considered a form of subsidization, which is not permitted. Information systems managers must exercise caution in systems development efforts where shared systems are involved.

EXHIBIT III-2



- Prior to deregulation, carriers were highly centralized with a primary focus on technology. Since deregulation, their focus has shifted to customer service and marketing. With the change, there is increasing decentralization, as responsibilities move closer to the customer. The decentralization creates needs for more sharing of data and flexible systems that are responsive to customer demands.

- Many telecommunications providers are ill-prepared to successfully apply new technologies. With a background in voice and data services, many have little knowledge about local-area networking. Few have any background in electronic imaging. While carriers have been enhancing their skills to include local-area networking, few have any greater knowledge than most other companies.

- Accompanying the regulatory constraints and new technologies, most providers are under severe pressure to reduce personnel costs. Productivity enhancing tools provide some assistance in meeting commitments with reduced staffing, but do little to provide a foundation for addressing new technologies.

The issues are more pronounced among medium-sized and smaller providers. While the BOCs and IXCs assess strategic direction and prioritize major new applications, LECs must determine how to provide enhanced basic services with limited resources.

2. Broadcast Services

Key issues in broadcast services are more closely aligned with issues faced by IS organizations in other industries than with those of common carriers.

Exhibit III-3 provides a summary of major issues. Some are more directly related to broadcast services and some to the cable TV industry.

EXHIBIT III-3

Key IS Issues—Broadcast Services

- Reduced operating margins
- Staff reductions
- Aging systems
- Rapid growth

- The first three apply primarily to the major broadcast networks.
  - The state of the economy and shifting fortunes of programming ratings has had the effect of reducing operating margins. With the reduced margins and the need to invest in new program strategies, IS frequently is not able to make major investments in new applications.
  - Reduced revenue/expense ratios have also caused some reductions in staff, further reducing the ability to begin major systems initiatives.

- Coupled with reduced funding and organizations, systems are beginning to reach the end of their life cycles and need to be upgraded. However, because of the reduced funding, IS managers are having to make do with smaller changes than with major initiatives.

- While major networks are struggling with reductions in funding and staff sizes, the cable TV industry is struggling to keep up with an expanding customer base.

- Cable TV operators, particularly the small ones, are, in many cases, struggling with small systems that frequently require extensive manual intervention. They have begun to exceed to their ability to effectively manage the systems.

- Larger operators are placing increasing reliance on providers of comprehensive turnkey systems providers such as CableData.

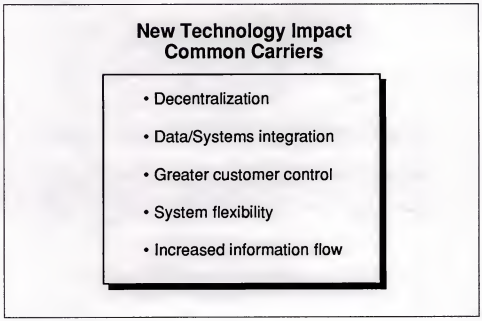
C

Impact of New Technologies

Exhibit III-4 summarizes the major impact of new technologies on nearly all common carriers.

- As with many industries, information systems in common carriers are being decentralized. Decentralization is most prominent in the marketing and customer service departments. Marketing and service are assuming greater responsibility for defining and managing development requirements and projects.

EXHIBIT III-4



- Organizational decentralization and the growing need for integration of data across functional areas are driving a need for the integration of systems. Data about customers and their service status must be available to operational and support departments.

- Customers recognize the value of digital technology and the value of many of the services that carriers are beginning to offer. But large customers resist the use of many services such as software defined networks, network management, and virtual digital networks.

  - Digital technology has created an ability for customers to directly control their networks and services. Customers want to be able to access carrier systems to define networks and change features and functions.

  - Customer demands create significant pressure on the carrier information systems organization to develop processes that permit greater customer control of their services. Greater customer access results in greater concern about system security.

  - Meeting customer demands is fostering new technologies—such as expert systems and artificial intelligence—in which many carriers have little knowledge.

- Large and small customers are demanding greater flexibility in defining services that will best meet their needs. Prior to digital technology and deregulation, carriers defined categories of services. Older technology did not permit great flexibility and carriers were not inclined to develop many options. Customers either accepted or declined to accept the defined service.

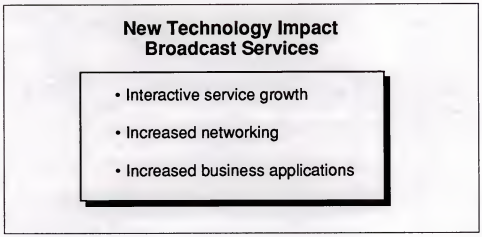
  Today, customers want to be able to select specific services to meet their needs and to be able to change them quickly and easily. They want custom sets of features and custom designed billing. They want to be able have analysis performed on both costs and service levels. Customer demand is exceeding the ability of carrier information systems groups to develop systems.

- There is a seemingly never-ending demand for greater bandwidth to pass greater amounts of data. From the introduction of the first wideband (T1) services ten years ago, carriers will soon be able to provide local- and metropolitan-area switched network services at speeds of 300-500 Mbps.

The broadcast services segment of the telecommunications industry has, as yet, not been significantly impacted by many of the technologies.

INPUT expects this to begin to change over the next few years. Exhibit III-5 highlights a number of impacts that new technologies will have on the broadcast segment of the telecommunications industry. Note that the majority of these will be in the cable industry.

EXHIBIT III-5



As noted earlier, the technologies that will have the greatest impact on the broadcast (primarily cable) industry will be fiber optics and digital technology. These will result in several secondary impacts.

- With the availability of increased bandwidth of fiber and digital technology, many of the limitations of coaxial cable will be overcome. The additional capacity of fiber coupled with the enhanced capabilities of digital technology will permit the introduction of new interactive services that have not been readily available in the past.
  - Cable companies will be able to compete directly with BOCs and alternative service providers for the provision of local- and metropolitan-area services.
  - Cable companies will be able to provide direct connections to electronic information service providers of higher quality than provided by many BOCs today.
- With a growing demand for interactive services, there will be a need for increased networking within the cable industry. Industry-wide networking is limited today, but this will change.
- There will also be a growing demand for business applications such as electronic mail, electronic data interchange, and electronic funds transfer.

Initial growth is expected to be slow. There is currently no single organization promoting the use of networking applications and there is no single cable service provider that can meet the needs of the entire industry. This will change also.

Organizations such as Cable Systems Group (part of American Express's Information Systems Group) and CableData are in key positions to be able to promote the growth of network services in the cable industry.

D

Organization and Budget

In larger carriers, there are frequently at least two information systems organizations. One is dedicated to developing and managing the carrier's switching systems. This organization typically reports to an operations executive.

The second organization is typically responsible for the company's internal and support systems. This organization may report to a Chief Information Officer or similar position, not unlike in other companies.

The distinction is important to vendors, since the priorities of the organizations are considerably different. The *internal* organization is increasingly functionally oriented. Its interest is in receiving the best value, recognizing that systems may need to be changed sometime later. The *operations* organization is more interested in the technical detail. Switching systems must be extremely precise and change is difficult.

Exhibit III-6 provides a summary of the distribution of the budget reported by internal information systems organizations. Overall, they reflect continued growth with external purchases showing a higher growth rate than internal expenses. Note that the purchased services category includes information services discussed in Chapter IV.

EXHIBIT III-6

Information Systems Budget Distribution

	1990 Percent of IS Budget	1990-1991 Percent of Expected Budget Growth
Personnel (Salary & Fringes)	35	4
Hardware	28	12
Purchased Services	37	16

- The growth rate for personnel includes two factors—salary increases and staff reductions. Information systems managers indicate that there will continue to be reductions in staff, but the reductions will be significantly less than has been noted over the past several years.

  As noted in INPUT's last report, managers believe that major reductions in force are near their end and that what remains is fine tuning. Much of the remaining reductions will be accomplished through attrition. The growth of personnel expenses reflects a net result of salary increases and expense reductions due to the attrition.

- The overall increase in hardware expense is higher than in many industries. Managers attribute the growth to the need for bigger systems to accommodate more complex applications and larger data bases. The growth in hardware also reflects growing focus on workstations to carry out increasingly complex tasks.

- Growth in purchased services includes software and services discussed in the following chapter. It also includes expenditures for voice and data communications services provided by other (non-value-added) carriers. The growth is attributable primarily to growth in professional and systems integration services.

Within the broadcast services segment, the expenditure breakdown is more in line with that in other industries. Expenditures for personnel and hardware are a higher percentage of the total and external purchases are lower.

E

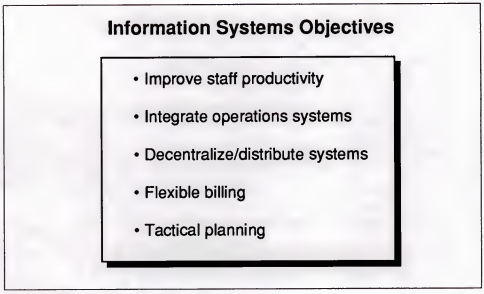
IS Department Objectives

Information systems managers continue to note several objectives that will be paramount in their plans for the next year or two. In general, they reflect the final stages of the evolution that began with deregulation and have been progressing for the past two to three years. Key objectives are summarized in Exhibit III-7 and discussed below.

- Pressure to increase the productivity of information systems staff continues. With major reductions in staff sizes reasonably complete, attention has shifted to identifying productivity-enhancing tools and procedures. Technology training has increased and productivity tools such as CASE and DBMSs are at the forefront of technology planning.

- There is a continuing need to integrate operational and support systems. Near-term efforts continue to be on the integration of maintenance service systems with customer service and billing systems. With maintenance now a billable item, there is need to ensure service tracking and accurate billing. Cable management systems must also be integrated to support service and maintenance requests.

EXHIBIT III-7



- Integrated systems must support customer service representatives who are increasingly decentralized into marketing departments. Marketing departments are increasingly in need of market profile data to target service offerings.

- Following several years of emphasis on strategic planning at corporate levels, emphasis is now shifting to tactical systems planning. Major fix-up efforts are reasonably complete. Information systems organizations are now focusing their attention on the best approaches to deploying systems that will meet future service and technical needs.

- More flexible billing systems are needed, to respond to customer needs for customized billing. Systems are needed that will provide support statements that reflect a customer's way of doing business and provide analysis of costs. Customers need to be able to assess the cost of features and the cost of special tariff provisions.

Over the past two to three years, the key word in most information systems organizations has been *survival*. Survival is still a necessity, to a certain extent, but the overall focus has begun to shift to developing systems that will meet the needs of the future. Cautious optimism and growth are increasingly the watchwords.

Information Services Market

A

Overview

1. Market Overview

As noted in Chapter I, there are an estimated 22,000 providers of telecommunications services in the United States.

- Common carriers represent only 9% of the total providers, but two-thirds of the total expenditures for information services.
- Within the common carrier group, RBOCs and IXCs represent 80% of the industry's revenues and account for half of the industry's information services expenditures.
- Since approximately 90% of the industry's revenues are for the provision of regulated services, the majority of information services expenditures are to support regulated activities.

INPUT believes that the overall situation will begin to change within the next several years.

- Cable companies will begin to provide network-based (information) services within the next several years. This will open new opportunities for vendors and create pressures on the common carriers and independent service providers.
- The regulatory environment is easing (slowly and somewhat painfully, but still easing), resulting in greater emphasis on information services that can be provided as an adjunct to regulated (basic) services. Regulated providers will need to become more competitive.
- Because of changes taking place, the revenue mix will begin to change, as will the mix of expenditures for information services.

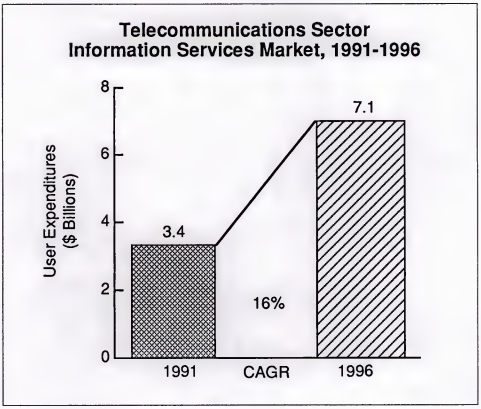
2. Market Summary

Until recently, information services expenditures have been directed primarily at gaining control of the environment and increasing productivity.

While considerable investments have been made in new (non-regulated) activities, significant improvements have also been made in productivity and cost effectiveness. After a number of years of considerable struggle, the industry has achieved a level of stability.

Overall, the market for information services in the telecommunications industry will grow at a compound annual growth rate of 16% over the next five years, from $3.4 billion in 1991 to $7.1 billion in 1996, as shown in Exhibit IV-1.

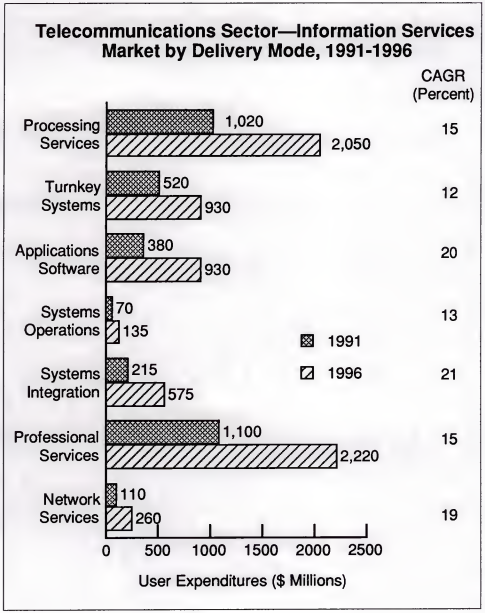
EXHIBIT IV-1



The market, broken down by delivery mode, is shown in Exhibit IV-2. Each delivery mode is discussed in the next section.

Note that there have been changes in the size of the market for several of the delivery modes. This results from greater research emphasis being placed on information services provided to the broadcast (primarily cable) segment of the industry. Changes are noted in the delivery mode discussions that follow.

EXHIBIT IV-2



Two delivery modes clearly lead the telecommunications sector—processing and professional services.

Processing services are needed to support the numerous smaller carriers that are too large to be able to meet their needs with workstations and PCs and too small to have large information systems organizations. In addition, processing services are used extensively in the cable industry.

Professional services are also in great demand to assist large organizations in identifying, planning, and developing major new systems. Vendors that have experience in developing large, complex, integrated systems will find a ready market as carriers develop comprehensive new systems capabilities. Growth in systems integration will complement professional services, as larger carriers invest in new technologies such as electronic imaging systems.

Systems operations is expected to remain comparatively small, since large carriers will not permit outsiders to have total responsibility for their core business systems. Unlike other businesses, where information systems are an anomaly, information systems are the primary business of common carriers.

B

Delivery Mode Analysis

1. Processing Services

The market for processing services (transaction processing) is expected to remain strong, growing at an annual rate of at least 15% for the next several years. The market is expected to grow from $1 billion in 1991 to an estimated $2 billion by 1996, as shown in Exhibit IV-3.

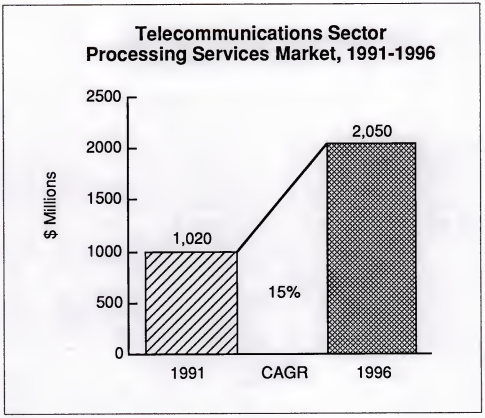
Note that the size of the processing services market has been increased by approximately 20% over last year's figure. The increase results from more extensive analysis of activities in the broadcast segment of the industry.

The increase is attributable primarily to revenues gained by organizations such as CableData and Cable Systems Group. CableData is the largest provider of billing services to the cable industry and has recently begun expanding into the cellular industry.

Growth of processing services is expected to remain strong for several reasons.

- Implementation of digital technology by smaller providers (LECs) has lagged behind the RBOCs and IXCs, but modern switching and control equipment is being implemented at an increasing rate. With the new technology, smaller providers continue to be interested in offering levels of service comparable to those in major metropolitan areas.

EXHIBIT IV-3



- Smaller providers in both the common carrier and broadcast segments of the industry do not have the financial strength to make major investments in customer systems. They are reliant on service providers such as EDS, CableData, GEIS, and CBIS to meet their processing needs.

- As new technology is implemented, maintaining plant and equipment records becomes increasingly complex. Records that could be maintained manually ten to fifteen years ago must now be maintained by sophisticated systems. Although many of the smallest providers are making greater use of PCs and workstations to maintain records, there are many that are outgrowing the capability of desktop systems.

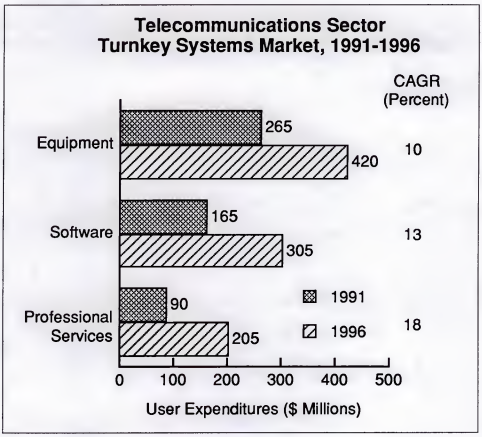
- Likewise, as the cable industry expands, the need for complex customer and service support systems becomes increasingly important. Many smaller providers are unable to make the necessary investments in large, complex systems.

2. Turnkey Systems

The market for turnkey systems is expected to continue to grow at a somewhat faster rate in the telecommunications sector than in the information services industry as a whole.

As shown in Exhibit IV-4, the market will grow at a compound annual rate of 12% for the next several years. Between 1991 and 1996, the market will grow from $520 million to $930 million.

EXHIBIT IV-4



- The growth of turnkey systems results from the need for an increasing number of application-driven services such as voice messaging, E-mail, and EDI, and the need for universal gateways that are operated as standalone systems.

- The need for turnkey systems arises from several factors.

  - First, there is a reluctance on the part of carriers to incorporate information service-related functions directly into switching systems. Information service applications are frequently changed to make enhancements and corrections. Carriers do not want the changes made to applications to affect their basic delivery systems.

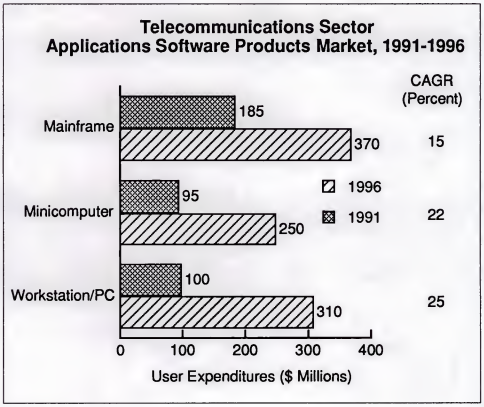
- The second reason, in the common carrier segment, is equally important. Regulations prohibit the co-mingling of funds or assets. Carriers must maintain clear distinctions between assets and funds used to support the delivery of basic (telephone and circuit) services, and those employed to provide information services. Incorporating applications directly into the core infrastructure could be viewed as subsidization of information services by the basic systems. The risk of regulatory challenge is unwarranted.

- In the cable industry, turnkey systems are becoming increasingly important. With the exception of the largest providers, developing large complex systems to maintain accounts exceeds the ability of many providers. Turnkey systems will become increasingly important as the cable industry begins to broaden its services. For many cable service providers, turnkey systems will be the only viable method of obtaining cost-effective systems.

3. Applications Software Products

The market for application software will remain strong, growing from $380 million in 1991 to an estimated $930 million by 1996, a compound growth rate of 20% (Exhibit IV-5).

EXHIBIT IV-5



The demand for applications software is being driven increasingly by the need for minicomputer and PC/workstation software. However, there is growing demand for mainframe software—in at least two critical areas—that will become more pronounced over the next several years.

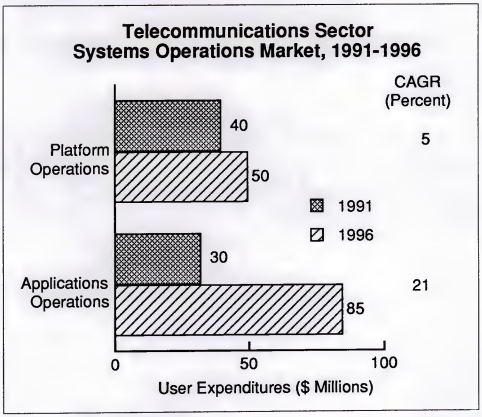
- Workstation/PC software is needed to support logistics and maintenance activities. Engineers need to be able to access central systems to obtain cable and circuit diagrams and obtain information about numbering assignments. Customer service and maintenance representatives also need to obtain information about the status of a customer's services. Workstations and PCs are being used increasingly to reduce the volumes of paper previously associated with service and work orders.

- The need to support imaging and mainframe-based artificial intelligence systems will contribute to significant growth over the next several years. These applications are only beginning to emerge, as carriers acquire increasingly sophisticated billing and customer support systems.

4. Systems Operations

The systems operations market is comprised of two elements: platform operations and applications operations. Platform operations refers to the management of an organization's computing hardware. Applications operations refers to the management of an organization's hardware *and* operational applications.

EXHIBIT IV-6



The market for systems operations in the telecommunications sector is expected to grow from $70 million in 1991 to an estimated $135 million in 1996, at a compound annual growth rate of 13%.

- Platform operations represents the largest portion of the systems operations market, but this has begun to change. The majority of systems operations services are provided to carriers that are too small to support large data center operations and too large to manage their business on workstations and PCs. Services are provided through direct links to major providers of operations services.

- As applications become more complex, an increasing portion of systems operations will include the management of applications that support business functions.

- As noted in the exhibit, platform operations are expected to grow nominally while applications operations grow at a significantly higher rate over the next five years.

- Note that systems operations are confined primarily to small and medium-sized common carriers and medium-sized cable operators. For large carriers (BOCs and IXCs), systems operations are an integral part of their service base. Unlike other industries, where information systems are an anomaly to their business, information services are the business of common carriers. The large providers are less likely to contract with a vendor to provide service that is central to their business.

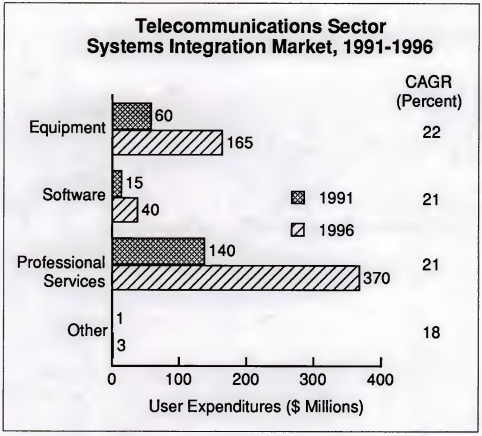
5. Systems Integration

Systems integration services currently represent approximately 6% of the sector, as shown in Exhibit IV-7. This percentage is expected to increase to 8% by 1996, due to a growth rate of 21% over the next five years. There are several reasons for the growth.

- Since deregulation, carriers have devoted extensive resources to enhancing their primary applications software. The billing and customer service systems that they inherited functioned poorly and were not able to meet changing needs. The majority of these systems have been either enhanced or replaced. However, the process of integrating major systems is just beginning.

- Customer service systems, containing profiles of a wide variety of features and services, must increasingly be linked to maintenance and network configuration systems. Charges for features must be integrated with charges for maintenance and trouble-shooting.

EXHIBIT IV-7



- Systems must be integrated to be able to provide analysis of costs and network structure. Integrated systems are necessary for carriers to successfully provide network management services.

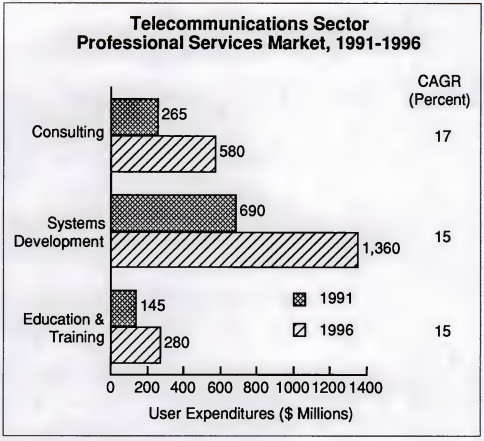
- In addition to the common carrier-based factors, there will be a growing need for integrated (network) service delivery systems to support the cable industry. The requirements are expected to begin to arise near the end of the forecast period.

6. Professional Services

Professional services represents one of the leading delivery modes in the telecommunications sector. There is a continuing need for both consulting and software development services to meet changing needs in a competitive market.

As shown in Exhibit IV-8, the professional services market is expected to grow at a compound rate of 15%, from $1.1 billion in 1991 to $2.2 billion by 1996. Systems development represents nearly 65% of this total.

EXHIBIT IV-8



- As a result of severe reductions in staff and with the growing complexity of systems, carriers are turning increasingly to professional services to develop system specifications and perform system development. Professional services firms have a broader knowledge of application needs and requirements.

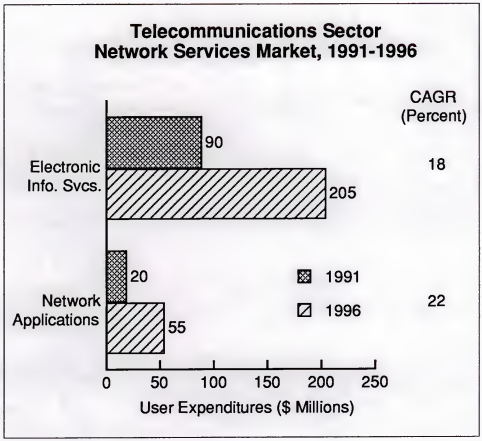
- In addition, use of professional services firms provides a means of training information systems staff in processes and procedures. Although many carriers have upgraded staff skills, information systems managers indicate that additional training is still needed.

- Use of professional services also reduces implementation time. As system criticality grows, due to the development of revenue producing services, reducing development time will be more critical.

7. Network Services

The market for network/electronic information services is expected to continue to grow, from $110 million in 1991 to an estimated $260 million by 1996 (Exhibit IV-9). However, a number of changes are worthy of note.

EXHIBIT IV-9



- Common carriers report that their need for electronic information services has declined over the past year or two, and the rate of growth is not expected to increase significantly. While there has not been significant decline in their current expenditures, they do not expect the rate of growth to be as great as in the past.

- The primary reason for slowing growth is the weakening demand for the type of information provided by on-line services. Demand over the past few years has been primarily for econometric data and information about companies. With carriers re-focusing on their core business, their need for this type of information has decreased.

- Although it is the smaller portion of network services, network applications is expected to show strong growth as an increasing number of allowable services are identified. The market for network applications is expected to grow at an estimated 22% for at least the next several years. More importantly, the demand for network applications will increase significantly near the end of the five-year period. The demand will be driven by two factors.

- With the expected entry of the cable industry into network services, there will be a growing need for value-added network services such as E-mail, EDI, and VAN services. Services such as E-mail will be one of the early value-added services that the cable industry will provide to business.

- The cable industry will also seek to provide value-added network (VAN) services, particularly to companies in narrow geographic areas.

With the emergence of cable companies as competitors, common carriers will need to provide comparable services to their business customers. Growing competition for services provided to business will be an overall stimulus to the industry.

C

Industry Sector Analysis

1. Driving Forces

Major driving forces in the telecommunications industry are shown in Exhibit IV-10. Note that they focus on the continued need to provide better internal support for changing organizations and to make better use of available resources.

EXHIBIT IV-10

- Although the major, immediate effects of deregulation have passed, information systems managers still identify divestiture and deregulation as the force that dominates the industry. Most managers believe that the traumatic effects on the industry are over, but believe that residual effects will continue to be felt for a few more years.

  The primary effect is intense pressure for competitive performance. This has become a baseline driver behind much of the shift to outside services, as a means to play catch-up. All managers recognize that they could not have competed successfully with the systems and technology that they started with, immediately following deregulation.

- With increased competition, customer-oriented services have become a necessity. Decentralization has moved staff closer to the customer. With the move, there continue to be needs to integrate service and support systems. Customers will not accept multiple points of contact. Marketing and customer service representatives must have access to companywide data about service and support. With this need, there is growing demand for open systems and integrated internal networks.

- Increasingly flexible software will be needed to support customers that want to be able to change service features immediately. Two- or even one-week delays are not acceptable. Business customers want to be able to change service features directly from their own premises, which creates additional demand for open system architectures and data base systems.

- A key to competitiveness is staff (information systems and user department) productivity. CASE tools contribute to productivity of information systems. Electronic imaging systems provide significant productivity advances to user departments.

- As in other industries, information systems executives in telecommunications are increasingly driven by user departments, as users respond to growing customer demands. The complexity of carrier systems has slowed the move of information systems into user departments, compared to other industries. But the move has begun, creating demand for systems to be deployed more quickly and cost effectively.

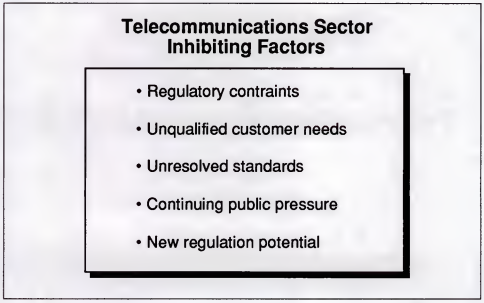
- The competitive environment is changing. The entry of the cable industry will create confusion and new demand. Confusion will result from new alliances and new ways of evaluating competitive positioning. Common carriers, which tend to be somewhat insulated today, will be faced with new competitive threats.

- New demand will result from the need of cable companies to provide a broad range of services and of common carriers to provide competitive services.

2. Inhibiting Factors

In addition to the driving forces, there are a number of inhibiting factors to growth of information services in the telecommunications industry. Key factors are summarized in Exhibit IV-11.

EXHIBIT IV-11



- Regulatory constraints on common carriers continue to top the list of inhibiting factors. While there is progress toward easing regulations, regulations will continue to prohibit major carriers from utilizing their basic infrastructure to deliver information services. This has a major dampening effect on the development of new systems.

- The needs stated by customers have generally not been qualified. The ability to make changes remotely to service features or network configuration are frequently cited by both customers and information systems managers as key market needs. But few carriers have made significant investment in evaluating the real benefits or market potential of the services. In addition, tariffs for the services would need approval, significantly complicating the process of assessing cost benefits.

- Many standards such as open system architectures and EDI are still unresolved. Many carriers are reluctant to make major investments to provide these services until they are certain that standard changes will be minor.

- Consumer advocacy groups are continuing to pressure carriers to provide cheaper services. With the change from profit to price ceilings, public pressure could intensify if profit margins appear to be excessive, as interpreted by advocacy groups. The groups generally have little interest in new services, or the benefits of delivering the services. They are single-minded, focusing on the provision of cheap, basic service.

- There is a significant risk that cable company entry into telecommunications could result in an increase in regulations. BOCs can be expected to be highly protective of their local service markets. BOCs are not permitted to use their installed equipment or circuits to deliver television programming. They will be reluctant to let cable companies deliver voice (or data) services.

Overall, the driving forces significantly outweigh the inhibiting factors. Expenditures for information services will continue to grow at a rate somewhat greater than the industry as a whole. Emphasis on improving core systems will provide greater opportunities for most vendors of information services, particularly those that provide processing and professional services.

Competitive Environment

With the advent of deregulation, many vendors established industry-specific groups to develop business with key industry leaders such as AT&T and the RBOCs. But encumbering regulation and poor systems caused the industry to evolve more slowly than anticipated. Regulation and the need to fix antiquated systems precluded the rapid deployment of many new or planned services. As a result, most of the carriers (BOCs) have had to spend considerable time, effort and money to fix or redo their billing and customer service systems.

To vendors, the need to focus on fixing problems has been a mixed blessing. Leading vendors have established solid market niches by assisting in the fix-up process. Others, whose focus has been on applying new, creative technology, have had to wait for the industry to stabilize.

Software available at the time of deregulation did not adequately provide for customer-oriented business, nor did it meet the needs of intercompany billing required for the LATA and IXC-oriented structure. This has caused a drain on resources and diluted management's ability to focus on new products and services.

Although considerable work has been completed, much remains to be done to meet the needs of the future. As noted previously, INPUT believes that the industry is now reaching a level of stability and maturity that will permit investment in new technologies and systems to support new services.

Though the sector is in a position to invest in new services, there is also an emerging competitive threat from cable service providers.

The extent to which cable companies will provide significant competition to common carriers is open to question, but their potential emergence as providers of comprehensive network-based services opens opportunities for vendors of information services.

Research on the providers of information services to the telecommunications sector results in several conclusions.

- The leading vendors are providers of processing services and systems operations.
- Professional services are provided primarily to common carriers. Processing services are provided primarily to the broadcast (cable industry) segment of the sector.
- The largest vendors to the industry account for only an estimated 10-12% of the sector's spending. The majority of the spending is with numerous smaller local and niche vendors.

A Vendor Characteristics

A key characteristic of the telecommunications sector is that there are numerous providers of a wide range of information services. The majority provide service in only one, or at most two, delivery modes. With some 2,000 common carriers (LECs, IXCs, etc.) and more than 9,000 cable service providers located throughout the country, there are numerous local and regional information service providers to the telecommunications sector.

However, of the many providers, several derive significant revenue from services provided to the telecommunications industry.

Exhibit V-1 identifies the five leading vendors of information services to the telecommunications sector and the delivery modes from which they derive the majority of their revenues.

When considering the leading vendors, there are several points to note.

- INPUT's data excludes expenditures for switch system software. Switch system software is highly specialized, frequently delivered as part of a switching system, and is more analogous to embedded software than true system or application software. Providers of switch systems and software are not included in the vendor analysis.
- Bellcore is not included in INPUT's vendor analysis. While Bellcore is an independent company, it is, effectively, owned by the Bell Operating Companies (BOCs). INPUT therefore considers its revenues to be captive revenues. Were it not for the captive nature of the revenues, Bellcore would be the largest information services vendor to the telecommunications industry.

EXHIBIT V-1

Leading Information Service Providers
Telecommunications Sector, 1990

Company	Delivery Mode
CableData	Proc. Svcs., Turnkey Sys.
Electronic Data Systems	Sys. Ops., Sys. Int.
American Express/CSG	Proc. Svcs.
Cincinnati Bell	Proc., Svcs., Sys. Int.
American Management Systems	Software, Prof. Svcs.

- It is important to note that revenues derived from the telecommunications sector are frequently only a small percentage of a company's revenues. With the exception of CableData, revenues for the leading vendors generally represent no more than 8-10% and seldom exceed 15% of the company's (non-captive) revenues.

  With the exception of CableData and American Express's Cable Systems Group, which have established significant footholds in the turnkey systems and processing services markets (to the cable industry), services to the telecommunications sector are frequently an adjunct to a company's primary business, not its primary business.

B

Leading and Emerging Vendors

The industry continues to be dominated by well-established vendors. This is not expected to change, at least in the short term.

Vendors such as AMS, CBIS, Computer Horizons, EDS, and GEIS continue to be leaders in applications and processing services to the common carrier segment of the industry.

CableData and American Express are the leaders in providing information services (primarily processing services) to the cable industry. Together, they hold an estimated 60-70% of the market for information services to the cable industry.

However, analysis suggests that the market is changing and that there may be a number of changes over the next several years.

- The cable industry is beginning to consider entry into network-based services. Data from the Federal Communications Commission indicates that cable companies have been submitting a high number of applications to test PCS (Personal Communications Service) services. Over the past year, cable companies have submitted the highest number of applications.

- With more than 9,000 providers of local (cable) service, an extensive effort will be needed to develop and manage an integrated network. There is currently no integrated network supporting cable providers. Though there has been no need for such a network to date, there will be a need if the providers are going to successfully deliver applications such as E-mail and EDI.

- Although American Express has little experience in the cable industry, it has extensive experience in managing networks and leveraging the value of networks to provide financial control and marketing. The Cable Systems Group could become a catalyst for developing industry networking.

- EDS has recently acquired Appex, a large provider of billing services to the cellular telephone industry, and ONA, a provider of billing and collection services to common carriers. With EDS's expertise in managing networks, it could also become a major catalyst in developing a wide variety of network-based services for the cable industry.

- A not-to-be-forgotten element is the potential role of VANs in providing networking services for the cable industry. An alliance between an organization such as CableData and one of the VANs could result in an industry-wide network within a very short time.

- On the opposite side of the coin, there are indications that CableData, Cable Systems Group (American Express), and Appex (EDS) are interested in providing an increased number of services (primarily processing services) to common carriers.

INPUT believes that the industry is beginning to change. Over the next several years, there will be increased emphasis on network-based services. While processing services such as billing will continue to be valuable, successful vendors will need to be able to provide a wide variety of transaction services.

C

Vendor Profiles

1. CableData

Founded in 1965 to provide data processing and billing services to cable television companies in the Sacramento, California area, CableData has become the leading provider of subscriber management information and billing services to the cable industry.

CableData is actually the operating name used by U.S. Computer Services, the parent company of CableData. U.S. Computer Services is a private company that includes a number of operating entities. Its two primary subsidiaries are CableData and International Billing Services.

CableData is the recognized name and the name under which most services are marketed and managed. International Billing Services is an operating group that provides production billing services.

In addition to these services, CableLease provides lease financing for turnkey systems. CableData International provides services in Canada and other international locations.

CableData provides a complete system for managing a cable operator's account management and billing requirements. Systems can be operated as standalone systems or through service facilities in several locations around the country.

Output from the systems can be sent or transmitted to CableData's International Billing Services (IBS) group, which will print and mail the statements. IBS also provides facilities for developing and mailing advertising.

In the early 1980s, the cable industry grew at rates that exceeded 25-30% per year. Recent growth has been in the range of 6-8% per year. Analysis of industry data indicates that a saturation point may be reached within the next several years.

If CableData expects to continue to grow, it will need to begin to consider new areas of opportunity. In addition, if it expects to compete with organizations such as EDS and American Express, it will need to take a leadership role in providing network services.

2. Electronic Data Systems

Founded in 1962, Electronic Data Systems (EDS) is a leading information and communications services company, providing information processing, consulting, systems management, systems integration, and communications services to a wide range of industries.

EDS currently has more than 60,000 employees and more than 7,000 clients in 50 states and 27 countries. EDS's largest client is General Motors and its subsidiaries. Services to General Motors accounted for approximately 55% of EDS's 1989 revenues. EDS operates 21 Information Processing Centers (IPCs) worldwide.

Telecommunications sector revenues represent a small portion of EDS's revenues. Although EDS has recently paid greater attention to identifying opportunities in the telecommunications sector, only an estimated 3% of its revenues are from telecommunications.

Recent acquisitions suggest that EDS may increase its efforts to become a major provider to the telecommunications industry. EDS recently acquired Appex, a large provider of billing services to the cellular industry, and ONA, a provider of billing and collection services to common carriers. While these may not be considered major acquisitions, they are consistent with EDS's business strategy.

EDS expects to continue to grow significantly in the systems operations market, by expanding its penetration in current markets and by entering new markets. EDS's selection criteria for new markets includes the size of companies in the sector, changes taking place in the sector, and how the changes will influence the receptivity of prospects to systems operations.

The telecommunications industry may offer EDS significant opportunity, at least in the longer term. In the short term, there are opportunities to assist with billing services to common carriers. In the longer term, EDS is in a key position to become a major provider of network-based services to both business and consumers.

EDS's strength in providing network services results in EDS being perceived as a threat to many common carriers, particularly as the industry evolves to a broader base of integrated network services.

However, as a non-common carrier, EDS can add significant strength to LECs and independent carriers as an ally. Alliances can alleviate the perceived threat and establish EDS as a contributor to the delivery of integrated network services.

3. American Express

Little note is made of AMEX's (American Express) progress in penetrating the processing services market. AMEX's experience in processing service dates back to the early 1960s when the number of American Express Card customers began to grow.

Since then, AMEX has branched out into other areas. It acquired First Data Resources to provide utility payment (credit card) processing services. It acquired a medical claims processing group and recently acquired a major interest in Cable Systems Group, the second largest provider of processing services to the cable industry. AMEX considers the cellular industry one that offers promising future growth.

In contrast to organizations such as EDS, AMEX's strategy has not traditionally been to provide contract (systems operations) services. Its strategy has been to acquire companies where there is significant financial benefit in managing the flow of funds. Targeting an industry such as cellular suggests that AMEX's approach is not going to change. It may also suggest a greater interest in providing more services to the telecommunications industry.

The telecommunications industry is highly capital intensive and has extensive cash management requirements. Managing the flow of funds and having ready access to an exceptionally large customer base could fit well with AMEX's strategy.

American Express has a sophisticated network and extensive networking capability. It has the ability to provide sophisticated billing and collection services. It has been successful in leveraging its knowledge about customers into comprehensive marketing for related, and not so related, services.

Either directly or through alliances, American Express could prove to be a strong competitor in the provision of transaction services to both common carriers and the cable industry. An added strength is that AMEX would not be considered a competitive threat to common carriers.

4. American Management Systems

American Management Systems (AMS) provides professional services, applications software and processing and micrographic services to a variety of industries.

The federal government remains its largest market, but the company has been working to achieve a greater federal/commercial market balance over the past couple of years. The federal government still accounts for an estimated 21% of the company's revenues, but AMS has realized increasing revenues from the telecommunications industry. Telecommunications industry revenues are estimated to have been approximately 12% of the company's revenues in 1990.

The company's revenues are derived primarily from professional services. A key service has been the development of customer billing, message processing, service order management and carrier access billing. The services are provided to local companies, inter-exchange carriers, international carriers, electronic mail providers, and cellular telephone companies.

With IBM's 10% investment in AMS and AMS's continued focus on the telecommunications and financial services sectors, the company is expected to continue to grow significantly over the next several years.

5. Cincinnati Bell Information Systems

Cincinnati Bell Information Systems (CBIS) was formed as an independent, unregulated subsidiary of Cincinnati Bell in 1983, as a result of deregulation. CBIS provides software products, professional and processing services to telephone companies, large corporations, and the government. CBIS continues to provide products and services to foreign PTTs.

Key software products are related to customer billing, order entry, message processing, cable records, customer service, construction management, and cellular account management. Products and services for the telecommunications sector are provided through CBIS's Telecommunications Information Systems business unit.

CBIS considers the telecommunications industry (both domestic and international) to be a strong niche for the company. However, it is placing increased emphasis on diversifying into non-telecommunications industry-related activities.

CBIS's focus on diversification is underscored by decisions to outsource some processing service activities previously done in-house. CBIS's focus on new industries has, until recently, included billing processing services for the cable industry. However, CBIS has recently outsourced processing activities to CableData, a major processing services company serving this industry. CBIS continues to provide processing services to cellular telephone companies, but the majority of revenues for this are captive.

While there has not been a significant change in the leaders in the telecommunications industry over the past several years, changes in the industry could begin to alter the mix of competitors over the next several years.

Evolution of the industry from a focus on basic services to value-added services will open opportunities for providing integrated products and network processing services that are not currently available.

A recent announcement of an alliance between AT&T, U.S. West, and Tele-Communications (TCI) to conduct a test of integrated services suggests that perhaps the strange bedfellows of the past will be the partners of the future. TCI is the largest cable industry multiple service operator.

Conclusions and Recommendations

A

Industry and IS Market Conclusions

Drawing from history, if the period immediately following deregulation were to be described as the dark ages, then the next several years might be described as the beginning of the renaissance period.

Transition from a highly regulated industry to a more competitive one has been, at best, difficult. Regulations will continue to stifle creativity, and treading a fine line between competitive and regulated business offerings will continue to retard the deployment of new technology and services. But indications are that the transition is nearing its end and that carriers are better prepared to operate in a competitive environment.

Depending on how it is viewed, the timing may be good or bad. From a carrier's standpoint, the timing might be considered bad.

At a time when carriers have begun to reach a point of stability and IS departments might be able to begin to focus on the creative use of technology, regulations are still a significant impediment, and the competitive environment is beginning to change.

Over the next several years, carriers will continue to receive pressure from their business customers to provide more comprehensive services. While carriers consider the regulatory impact, cable companies will begin to seek ways to provide similar services.

Technology constraints will prevent cable companies from competing directly for at least the next two to three years, but progressive companies will begin to provide limited services and plan to provide a broad-based set of services.

The demand for services, coupled with the growth of competition, will place strains on information systems departments. To respond to the needs, they will need to turn to information services vendors.

For information services vendors, the timing could be considered good. Increasing demand for new services and emerging competition will result in greater opportunities. Although there will be opportunities in nearly all the delivery modes, the greatest opportunities will still be in processing and professional services.

In the latter part of the five-year period, greater opportunities will emerge in network applications and systems and network integration. These will result from the need to compete with cable service providers, who will be able to provide integrated services to businesses and consumers.

B

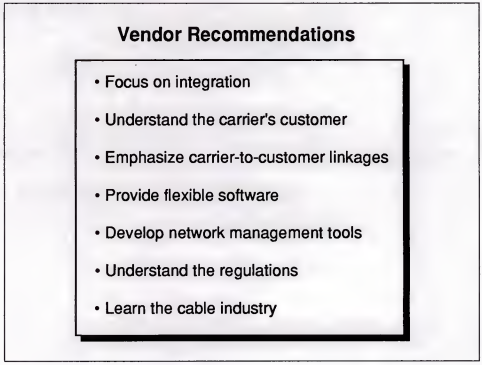
IS Vendor Issues and Recommendations

Exhibit VI-1 provides a number of recommendations for vendors entering or considering expansion into the telecommunications sector.

- Integrated systems will be the key to success for carriers within the next several years. For all but the smallest carriers (small LECs), who will turn increasingly to processors, the integration of service systems is mandatory. These must also be integrated with management control systems.

  Internal integration is also necessary as carriers progress with decentralization. Systems and services (LANs, E-mail, etc.) are necessary for effective communications between operating groups and functions that are no longer concentrated in one area.

EXHIBIT VI-1



- Vendors need to understand what the carriers' customers *really* want, not what they say they want. Frustration at lengthy service deployment has caused customers to demand more and more. Many recognize that they will only get a portion of what they want. Most are willing to pay for services that are valuable to them, but they will not commit to services until they understand the costs. Vendors that understand what a carrier's customers really want and what they are willing to pay are better able to sell software and software development services.

- Linkages between carriers and their customers are becoming increasingly critical. Products and services based on accepted standards that permit users greater access to and control of networks are in increasing demand. Open systems and multiple-protocol support are among the leading needs, as evidenced by the success of value-added network carriers in marketing connectivity products and services.

- Software products that can be changed with moderate ease will replace complex, hard-coded systems. This will drive the demand for data base and parameter-driven systems that permit flexibility in defining features and options. In addition, systems such as SQL will be in increasing demand to meet changing management requirements.

- Carriers are placing growing emphasis on marketing virtual network services. But customers are reluctant to permit carrier control without an ability to manage the network. Comprehensive network management tools that permit customers to have visibility and control are mandatory to the success of virtual network services.

- Understanding the regulations is critical to marketing success. Such understanding is necessary to respond to objections and to structure products that acknowledge the environment that currently exists and the changes that are pending.

- Within the next two to three years, cable companies will be seeking ways to provide information services to both businesses and consumers. With a focus on information (data) services, there will be a need for integrated applications and networks. Neither the cable companies nor the major providers to the cable industry are currently successful in providing network-based applications.

The telecommunications market offers attractive opportunities, but vendors that market a wide variety of services may be at a disadvantage. Most successful vendors provide a product or service that addresses a specific need. The industry is highly specialized. Vendors need to be equally specialized.

Definitions

Appendix A provides a summary definition of a number of frequently used terms related to the telecommunications industry.

- *BOC (Bell Operating Company)* - The regulated entity of the Regional Bell Operating Companies.
- *FTS 2000* - A contract let by the federal government to provide government-wide telecommunications services.
- *Gateway* - A method used by BOCs to provide access to unregulated services. The gateway provides a point of demarcation between regulated (basic) services and unregulated or value-added services.
- *IEEE* - Institute of Electrical and Electronics Engineers
- *ISDN* - Integrated Services Digital Networks
- *IXC (Inter Exchange Carrier)* - Services providers such as AT&T, MCI, and Sprint that provide basic services between LATAs.
- *LATA (Local Area Transport Authority)* - Defined geographic area within which a BOC is authorized to provide service.
- *LEC (Local Exchange Carrier)* - Regulated service provider to a local geographic area. May be a BOC or an independent service provider.
- *MAN (Metropolitan -Area Network)* - Local-area networking capability provided over a large, metropolitan area.
- *MFJ (Modified Final Judgment)* - Court ruling providing basis for operating authority of regulated telecommunications service providers.

- *RBOC (Regional Bell Operating Company)* - Term used to describe regional providers of regulated and unregulated telecommunications services that were formerly part of AT&T.

- *RHC (Regional Holding Company)* - Term used to describe regional providers of regulated and unregulated telecommunications services that were formerly part of AT&T. Also referred to as RBOC.

- *SMDS (Switched Multimegabit Data Service)* - Switched circuit service providing transmission speeds up to 150 Mbps.

- *VSAT (Very Small Aperture Terminal)* - Small satellite dish (terminal), frequently measuring 3-4 feet in diameter.

For definition of standard terms used by INPUT to analyze and forecast the information services industry, please refer to INPUT's *Definition of Terms*. A copy should be found in the Market Analysis Program Overview binder or clients may contact INPUT for a copy.

B Forecast Data Base and Reconciliation

Appendix B provides the forecast data base (Exhibit B-1) and a reconciliation of this year's forecast with the previous year (Exhibit B-2).

EXHIBIT B-1

Telecommunications Sector
User Expenditure Forecast by Delivery Mode, 1990-1996
($ Millions)

Delivery Modes	1990 ($ M)	Growth 90-91 (%)	1991 ($ M)	1992 ($ M)	1993 ($ M)	1994 ($ M)	1995 ($ M)	1996 ($ M)	CAGR 91-96 (%)
Sector Total	2,963	15	3,413	3,928	4,512	5,224	6,083	7,106	16
Processing Services	895	14	1,020	1,173	1,349	1,552	1,785	2,052	15
- Transaction Processing	895	14	1,020	1,173	1,349	1,552	1,785	2,052	15
Turnkey Systems	462	12	519	581	654	735	828	931	12
Applications Software	317	19	378	452	539	646	774	930	20
- Mainframe	160	15	184	212	243	280	322	370	15
- Minicomputer	76	22	93	113	138	168	205	251	22
- Workstation/PC	81	25	101	127	158	198	247	309	25
Systems Operations	63	13	71	80	90	102	116	133	13
Systems Integration	183	19	218	256	298	60	454	576	21
Professional Services	950	16	1,098	1,256	1,431	1,650	1,912	2,226	15
Network Services	93	17	110	129	151	179	214	258	19
- Electronic Info. Svcs.	76	17	89	104	122	148	171	204	18
- Network Applications	17	18	20	25	29	35	43	54	22

EXHIBIT B-2

Telecommunications Sector
1991 MAP Data Base Reconciliation
($ Millions)

Delivery Modes	1990 Market				1995 Market				90-95 CAGR per data 90 rpt (%)	90-95 CAGR per data 91 rpt (%)
	1990 Report (Fcst) ($ M)	1991 Report (Actual) ($ M)	Variance from 1990 Report ($ M)	Variance from 1990 Report (%)	1990 Report (Fcst) ($ M)	1991 Report (Fcst) ($ M)	Variance from 1990 Report ($ M)	Variance from 1990 Report (%)		
Total Telecommunications Sector	2,759	2,963	204	7	5,845	6,083	238	4	16	16
Processing Services	733	895	162	22	1,473	1,785	312	21	15	15
Turnkey Systems	420	462	42	10	769	828	59	8	13	12
Applications Software	317	317	0	0	774	774	0	0	20	20
Systems Operations	71	63	-8	-11	134	116	-18	-13	13	13
Systems Integration	183	183	0	0	480	454	-26	-5	21	21
Professional Services	950	950	0	0	1,926	1,912	-14	-1	15	15
Network Services	91	93	2	2	258	214	-44	-17	26	19

There are several differences between the 1990 and 1991 forecasts that are of particular note.

- While there have been no major changes in the overall growth rate for the industry, the overall market size has been increased by approximately 7%. The more than $200 million increase results from more in-depth analysis of the broadcast segment of the telecommunications industry.
- While there is little spending for information services among the majority of the broadcast segment (radio and television stations), spending by the 9,000 cable companies is greater than noted in INPUT's previous reports.
- In total, spending by the cable industry represents an estimated 20% of the telecommunications industry's spending.

- The majority of the spending increase is for processing services. The increase represents a 22% increase in the base size of the processing services delivery mode. The increase results from greater analysis of revenues from major processing services companies to the cable industry.

- The size of the turnkey systems market has been increased by approximately 10% due to a greater level of turnkey systems activity within the cable industry. The industry is becoming increasingly complex and is growing, though the growth rate has slowed.

- The systems operations market was reduced somewhat. The reduction was due primarily to a shifting to the processing services delivery mode.

- The overall growth rate of the network services delivery mode has been reduced. The overall reduction results from reducing the growth rate for electronic information services from its previous 27% to 18% this year. The broadcast segment of the industry is the primary driver in growth of electronic information services. Companies indicate continued increases, but not at the higher level.

- Network applications are a smaller portion of the network services delivery mode, but are expected to show the greatest rate of growth over the next five years. Network applications are expected to show growth rates of 25-28% near the end of the period. This will be due primarily to growth in the use of VAN and E-mail services.

About INPUT

INPUT provides planning information, analysis, and recommendations for the information technology industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Subscription services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services. INPUT specializes in the software and services industry which includes software products, systems operations, processing services, network services, systems integration, professional services, turnkey systems, and customer services. Particular areas of expertise include CASE analysis, information systems planning, and outsourcing.

Many of INPUT's professional staff members have more than 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

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